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The Effectiveness Of Patt_Art Media Based On Digital Literation In Introducing Mathematical Concepts For Early Ages

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Abstrak

Cabang matematika yang dikenalkan anak usia dini meliputi: berhitung, membilang, geometri, mengukur, mengestimasi, pola, dan statistika. Sangat disayangkan, kegiatan mengenalkan pola di lembaga PAUD masih menggunakan media yang tradisional. Pengenalan pola yang merupakan bagian dari konsep matematika di lembaga PAUD harus mengikuti perkembangan zaman. Perkembangan zaman sekarang berada pada era digital yang memungkinkan semua aktivitas yang dilakukan anak terintegrasi dengan media digital. Era digital pada saat ini menuntut semua komponen masyarakat sadar akan literasi digital, tidak terkecuali anak usia dini (AUD). Penelitian ini penting dilakukan, karena minim media pengenalan pola bagi anak. Sehingga hasil pengembangan media *Patt_art* akan bermanfaat sebagai alternatif media pengenalan pola. Tujuan penelitian untuk menguji keefektifan media *Patt_art* berbasis literasi digital dalam mengenalkan kemampuan matematika anak usia dini. Metode penelitian menggunakan metode penelitian eksperimen. RA NU Matholibul Ulum 01 akan dijadikan kelompok eksperimen dan RA NU Matholibul Ulum 02 menjadi kelompok kontrol. Teknik pengumpulan data yang akan dilakukan menggunakan teknik observasi dan tes lisan. Teknik analisis data yang akan digunakan *paired sample t test*. Hasil penelitian menunjukkan bahwa: 1) hasil belajar kelompok eksperimen lebih tinggi dibanding kelompok kontrol; dan 2) media Patt_Art lebih efektif daripada media konvensional.

Abstract

Branches of mathematics introduced by early childhood include: counting, numerating, geometry, measuring, estimating, patterns, and statistics. Unfortunately, the activity of introducing patterns in Early Age Education (PAUD) institutions still uses traditional media. The introduction of patterns that are part of the mathematical concepts at PAUD institutions must keep abreast of the times. The current development is in the digital era that allows all activities carried out by children integrated with digital media. The current digital era demands all components of society to be aware of digital literacy, including early childhood (AUD). This research is important to do, because of the lack of pattern recognition media for children, so that the results of Patt_art media development will be useful as an alternative media pattern recognition. This study aimed to examine the effectiveness of digital literacy-based Patt_art media in introducing mathematical abilities of early childhood. The research method used experimental research methods. RA NU Matholibul Ulum 01 became the experimental group and RA NU Matholibul Ulum 02 became the control group. Data collection techniques to be performed used observation techniques and oral tests. Data analysis techniques used paired sample t test. The results show that: 1) the learning outcomes of the experimental group were higher than the control group; and 2) Patt_Art media is more effective than conventional media.

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INTRODUCTION

Early childhood ranging from age 0-6 years need to know various knowledge and skills that will be useful for their future. Both basic knowledge and skills will be introduced as an effort to stimulate golden age for early childhood, including introducing mathematics. Many branches of mathematics introduced by early childhood include: counting, numerating, geometry, measuring, estimating, patterns, and statistics. In short, 4-year-old is important in developing early algebraic abilities, namely understanding repetitive patterns [Johnson, et al 2013].

Unfortunately, the activity of introducing patterns in PAUD institutions still uses traditional media. The introduction of patterns that are part of the mathematical concepts at PAUD institutions must keep abreast of the times. The current development is in the digital era that allows all activities carried out by children integrated with digital media. The current digital era demands all components of society to be aware of digital literacy. Digital literacy is both an opportunity and a challenge for the Indonesian people. Considering Indonesia is one of the many countries in the world that has the largest number of internet users [Ministry of Education and Culture, 2017]. Indonesia as the biggest internet user must be balanced with increasing digital literacy capabilities.

Preradociv [2016] produced a research article indicating that the need to introduce Information and Communication Technologies (ICT) to PAUD institutions in supporting AUD learning aims to advance children's success in various fields of capacity development. Indications for the introduction of ICT based on Preradociv [2016] led to the development of digital literacy-based Patt_art media in introducing the concept of metematics (patterns) for early childhood. If ICT can develop various fields of ability, hopefully Patt_art media can become an alternative media to introduce patterns for early childhood.

The compilation of research results states that introducing patterns for early childhood is more effectively introduced using media. Improvement of children's cognitive abilities in imitating patterns with a flannel board in kindergarten occurs starting from the initial conditions (Yosasra 2012). Study results of McDonald & Howell (2012), Fesakis, Sofroniou, & Mavroudi (2011), and Fessakis, Gouli, &

Mavroudi (2013) show that technology, in various forms, helps improve mathematical skills [Zomer & Kay 2016].

A research is necessary to be conducted, bearing in mind the minimal pattern recognition media for children, so that the results of the development of Patt_art media will be useful as an alternative media for pattern recognition. Based on the description, the researchers want to develop Patt_art media based on digital literacy that will be adjusted to the needs of PAUD institutions in introducing mathematical abilities for early childhood. This study aimed to examine the effectiveness of digital literacy-based Patt_art media in introducing early childhood mathematical abilities. This research aimed to examine the effectiveness of media *Patt_art* digital literacy-based in introducing the mathematical ability of early childhood.

Researchers propose a national competitive scheme focusing on the budding lecturer research scheme (PDP). However, researchers as young lecturers feel they have to develop the ability to carry out research and publish in national scientific journals. Researchers plan to make PDP the first step in a future road map for research, because the research focus is on early childhood mathematics studies and basic education.

LITERATURE REVIEW

Literature review that will be presented covers Patt_art media, digital literacy, mathematical concepts, and early childhood.

Media Patt_Art

Media has a meaning as a distributor or intermediary. Media in the world of education means an intermediary in learning that provides a beneficial effect in the form of ease in capturing information. Patt_art media is a type of digital visual media. Patt_art media is a combination of the word pattern and art. Pattern means patterns and art that have artistic meanings. Patt_art media is a medium that combines elements of pattern recognition and art performed in play activities. Pattern recognition is one branch of mathematics that should be introduced early. Pattern recognition for early childhood is important, because it will introduce the child's early concept of algebra.

Patt_art media is made from visual basic software. Patt_art is planned to include elements of color, shape, fiber size in order to introduce specific mathematical concepts, namely patterns. The Patt_art media development plan is in the form of geometric shapes and the child continues the missing shapes by selecting the shape options in the bottom column.

Patt_art Media is developed to answer the needs of the use of digital age technology. The digital age begins to penetrate the educational side, including PAUD institution. PAUD institution as basic education has an important role in introducing digital literacy to students.

Patt_art's media was developed by referring to Edgar Dale's theory. Edgar Dale's theory, which is popular with the cone theory of learning experience, states that the more the functions of the human senses at work, it is directly proportional to the acquisition of information received. Patt_art media will be designed so that this media can maximize the function of the senses. In other words, it will increase the acquisition of information absorbed.

Digital Literation

The digital age is a pathway from manual technology to digital technology. A simple example of technology transfer is a typing device that used to use a typewriter now turns into a computer or laptop. Digital literacy at PAUD does not rule out the possibility of converting a manual educational game tool into a digital-based educational game tool.

Digital literacy is knowledge and skills to use digital media by utilizing in a healthy, wise, intelligent, meticulous, precise, and law-abiding manner in order to foster communication and interaction in everyday life [Ministry of Education and Culture 2017]. Based on this definition, the use of digital media can be applied in the world of education. The existence of educational literacy in the world of education will provide its own knowledge and skills for its users.

Preschool age or PAUD is the right time to introduce various things. Introducing a variety of things, one of which is literacy at an early age is supported by rapidly developing brain function. Literacy needs to be developed because literacy is the basic capital of children to be able to learn and gain knowledge especially when children start entering school age [Sari 2017].

Digital literacy needs to be introduced to children from an early age. Provide the latest experience for children, not only using traditional games such as blocks, dolls, balls, puzzles, and sand but also every day needs to interact with technology such as digital media [Lee 2015]. The explanation gives an enlightenment that early childhood needs to be introduced to digital technology as a form of interacting with the plurality of emerging technologies.

Mathematics Concepts

Early childhood needs to know a variety of abilities. Both basic skills and behavioral development. Mathematics in early childhood has its own space, because mathematics introduced in early childhood will have many branches. Branches of mathematics introduced in early childhood include: counting, numerating, geometry, measuring, estimating, patterns, and statistics. Early childhood mathematical knowledge and skills need to be developed meaningfully through processes such as comparing, counting, symbolizing numbers, classifying, measuring, representing, estimating, and patterning [Chick 2005].

All branches of mathematics have benefits for early childhood in the future, including recognizing patterns. Introducing the ability of patterns turns out to underlie all mathematical thinking, such as the introduction of numbers, geometry, measurements, and data [Chick 2005]. In addition to the scope of mathematics, it turns out that patterns have close links with science, art, language, music, and physical education material [Chick 2005]. That is why, pattern recognition is always given to children.

Pattern recognition becomes the child's foundation as a form of algebraic thinking. Preschoolers spontaneously engage in early algebraic thought forms, namely patterns [Johnson, et al 2013]. Patterns that are introduced to early childhood are not always like AB-AB or ABC-ABC patterns. In fact, patterns can vary in the complexity of order, from simple order (for example, AB-AB; 1, 3, 5, 7) to more complex ones, such as with more complicated units (for example, ABCABB-ABCABB) [Collins & Laski 2015].

Introducing patterns to early childhood cannot be separated from the important role of an educator. Educators as facilitators must always upgrade their abilities to fit and be able to keep up with the times. The requirement for PAUD

educators to be able to keep up with the times because it is currently in the industrial revolution 4.0 which uses digital technology. It is important for educators who have explored learning practices to design learning techniques that can improve mathematics learning by utilizing ICT in the form of computers or tablets [Papadakis, et al 2016].

Early Childhood

Early childhood has its own phase in the stages of human development. Early childhood occupies the first phase in the span of human life. Childhood is known as the exploration period. It is because during childhood they explore their ability to use a variety of different media and make creative movements [Preradovic, et al 2016].

An early age that will not be repeated is the foundation for a child's life as an adult. Early childhood experience has a major impact on all areas of child development [Osakwe 2009]. Osakwe's statement stressed the importance of providing provisions in various fields of development and skills for young children. Provision of various fields of development and skills for early childhood can be done independently by parents at home or by educators in PAUD institutions.

PAUD is a means for children to develop social attitudes, develop thinking power and creativity, develop language and motor skills, and develop moral and religious values. PAUD is not a place for formal education, but rather is defined as a place for children who truly feel free [Roul 2014]. The aim of PAUD is to support child development at all levels [Preradovic, et al 2016].

METHODS

The research method used is an experimental method with a nonequivalent control group design. The population in this study is in PAUD institutions in Kudus Regency. The reason for choosing Kudus Regency is because several institutions in this region have used digital technology, both in the learning process and in the preparation of learning and reporting on learning activities reports. One of the PAUD institutions that have used digital technology along with internet facilities is Raudlatul Athfal Nahdlatul Ulama (RA NU) Matholibul Ulum 01. RA NU Matholibul Ulum 01 is used as an experimental group and compared with RA NU Matholibul Ulum 02 which is used as the control group. The choice of experimental

and control groups is because the institution is in the auspices of the foundation, so it has similarities in educators and students. Meanwhile, RA NU Matholibul Ulum 01 already has several supporting facilities for digital literacy and RA NU Matholibul Ulum 02 does not yet have internet facilities.

Data collection techniques to be performed used observation techniques and oral tests. Observation technique was used to see the child's ability to recognize mathematics, especially patterns. Measuring the ability to recognize patterns was done by observing so that the observation technique was chosen to be used as a data collection technique. Oral test was used as a data collection technique in this study, because in addition to observing later questions and answers were also carried out related to the ability to recognize the concept of patterns in children.

The results of the research data collected were analyzed, but previously a pre-test was conducted. Prerequisite tests were used to ensure that the two groups come from homogeneous groups and come from normally distributed data. Data analysis techniques used different tests. The results of the study were analyzed using two tests namely, paired sample t test and independent sample t test. Both tests were used so that the research results obtained can complement each other and become reinforcement in statistical testing.

RESULTS

The results of the study include prerequisite test results, learning outcomes and effectiveness tests.

Prerequisite Test Results

Prerequisite Test Results is presented in Table 1.

Table 1. Prerequisite Test

Test	Results	Note
Normality	0.000	Normal Distribution
Homogeneity	0.097	Homogeneous variant

It is normal if the normality test results are less than 0.05. Based on the normality test results, it was obtained 0.000 results, which means the data are normally

distributed. Furthermore, the data is called homogeneous if the homogeneity test results are more than 0.05. Based on the homogeneity test results, it was obtained 0.097, which means the data are homogeneous. When the prerequisite tests have been met, then the parametric test can be used using the t test.

Learning Outcomes

The learning outcomes in this study are the mathematic results of early childhood.

Patt_Art Media

The results of the experimental group learning are shown in Table 2.

Table 2. Experimental Group Learning Outcomes

Score	Criteria	Pretest		Posttest	
		∑	%	∑	%
1-2	MB	5	25	-	-
3-4	BSH	11	55	7	35
5-6	BSB	4	20	13	65

MB, BSH, and BSB criteria are adjusted according to the classification of developmental achievements in the scope of early childhood. MB means starting to develop, BSH means developing according to expectations, and BSB means developing very well. Classification of children's abilities is important to be done in order to know the limits of individual abilities between children.

Based on the data in Table 2, values were obtained before and after treatment. Mathematical outcomes of children before being treated include 5 children (25%) were in MB criteria, 11 children (55%) were in BSH criteria and 4 children (20%) were in BSB criteria. The average ability of the experimental group children before being given treatment is within the criteria of BSH.

After the treatment was given, the children of the experimental group had the result that there were no children in the MB criteria. There were 7 children (35%) in BSH criteria. There were 13 children in BSB criteria (65%). The average ability of the experimental group children after being treated are within BSB criteria.

Referring to the learning outcomes of the experimental group, it was found that the average of the experimental group before being given treatment was within

the BSH criteria. Furthermore, after the experimental group was given treatment, the mean learning outcomes increased at BSB stage.

Conventional mathematics media

The results of the mathematical abilities of the control group children can be seen in Table 3.

Table 3. Control Group Learning Outcomes

Score	Criteria	Pretest		Postest	
		∑	%	∑	%
1-2	MB	14	70	1	5
3-4	BSH	5	25	4	20
5-6	BSB	1	5	15	75

The results of the mathematical ability of the control group referred to from table 3 obtained the results of the pretest and posttest. The results of the mathematics ability pretest in the control group were 14 students (70%) in MB criterion, 5 students (25%) were in BSH criterion and only one student (5%) was in BSB criterion.

The results of the mathematics ability test in the control group show 1 student (5%) was in MB criterion, 4 students (20%) were in BSH criterion, and there were 15 students (75%) in BSB criterion. Therefore, the mean mathematical ability of the control group at the time of the pretest was at MB criterion and after the posttest was at BSB criterion.

In the analysis of the results of learning children's mathematical abilities, it is seen an increase in children's mathematical abilities using Patt_Art media. This can be seen from the increase in the criteria for children who were originally BSH to BSB. Meanwhile, children who were treated using paper which were originally in MB criterion, after being treated still showed BSB criterion.

The development of mathematical abilities used in this study is more emphasized on the achievement of learning outcomes (Rohmah et al 2016). Learning outcomes are behavioral changes obtained by students after experiencing learning activities (Rifa'i & Anni 2012). The term learning outcomes in this study refers to learning outcomes of mathematical abilities. Learning outcomes are analyzed from the results of the pretest and posttest.

Effectiveness test

Learning is said to be effective if it meets the effectiveness criteria, namely a significant increase between the experimental group and the control group.

Table 4. Paired Test Outcomes

Group		Mean		t	df	Sig 2 tailed
RAM1	Pretes	3.35	1.60	4.067	19	0.001
	Postes	4.95				
RAM2	Pretes	2.50	2.60	7.409	19	0.000
	Postes	5.10				

Referring to the results of the paired sample t test from the table 4, sig. 2 tailed experimental groups were worth 0.001 and the results of sig. 2 tailed control groups are worth 0.000. This figure is still below 0.05 which means that the two groups have differences between the pretest and posttest scores.

Based on the criteria of several tests of effectiveness: 1) the results of the experimental group mathematics learning starts from the BSH criteria to the BSB; 2) the results of the independent sample t test state the difference between the experimental group and the control group after treatment was given. Both of the results of this criteria state that post-treatment has effective results, in the sense that Patt_Art's media is effective in improving mathematical abilities of early childhood.

CONCLUSIONS

The conclusions from the results of this study are 1) the learning outcomes of the experimental group were higher than the control group; and 2) the experimental group used Patt_Art media for early childhood compared to the control group using conventional media.

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REFERENCES

B. Rittle-Johnson, E. R. Fyfe, L. E. McLean, and K. L. McEldoon. 2013. "Emerging Understanding of Patterning in 4-Year-Olds," *J. Cogn. Dev.*, vol. 14, no. 3, pp. 376–396.

D. Y. Sari. 2017. "Pengantar Redaksi," *J. golden age*, vol. II, no. April, pp. 77–86.

Kemendikbud. 2017. "Materi Pendukung Literasi Digital,".

L. Lee. 2015. "Digital Media and Young Children's Learning: A Case Study of Using iPads in American Preschools," *Int. J. Inf. Educ. Technol.*, vol. 5, no. 12, pp. 947–950.

M. A. Collins and E. V. Laski. 2015. "Preschoolers' strategies for solving visual pattern tasks," *Early Child. Res. Q.*, vol. 32, pp. 204–214.

N. M. Preradovic, G. Lesin, and D. Boras. 2016. "Introduction of digital storytelling in preschool education: A case study from Croatia," *Digit. Educ. Rev.*, no. 30, pp. 94–105.

N. R. Zomer and R. H. Kay. 2016. "Technology Use in Early Childhood Education : A Review of Literature," pp. 1–25.

P. Y. I. Chick, L. Helen, L. Jill, E. Proceedings, and J. Fox. 2005. "PRE-COMPULSORY YEARS," pp. 313–320.

R. N. Osakwe. 2009. "The Effect of Early Childhood Education Experience on the Academic Performances of Primary School Children," vol. 3, no. 2, pp. 143–147.

Rochmad. 2012. *Desain Model Pengembangan Perangkat Pembelajaran Matematika.* J. Kreano, vol.3, no.1, pp.59-72.

S. K. Roul. 2014. "Language Development of the Preschool Children : The Effects of an Audio-Visual Intervention Program in Delhi," *Int. J. Instr.*, vol. 7, no. 1.

S. Papadakis, M. Kalogiannakis, and N. Zaranis. 2016. "Comparing Tablets and PCs in teaching Mathematics: An attempt to improve Mathematics Competence in Early Childhood Education," *Presch. Prim. Educ.*, vol. 4, no. 2, p. 241.